MDT

MONTANA DEPARTMENT of TRANSPORTATION

A Study of

Commercial Motor Vehicles

Large Trucks

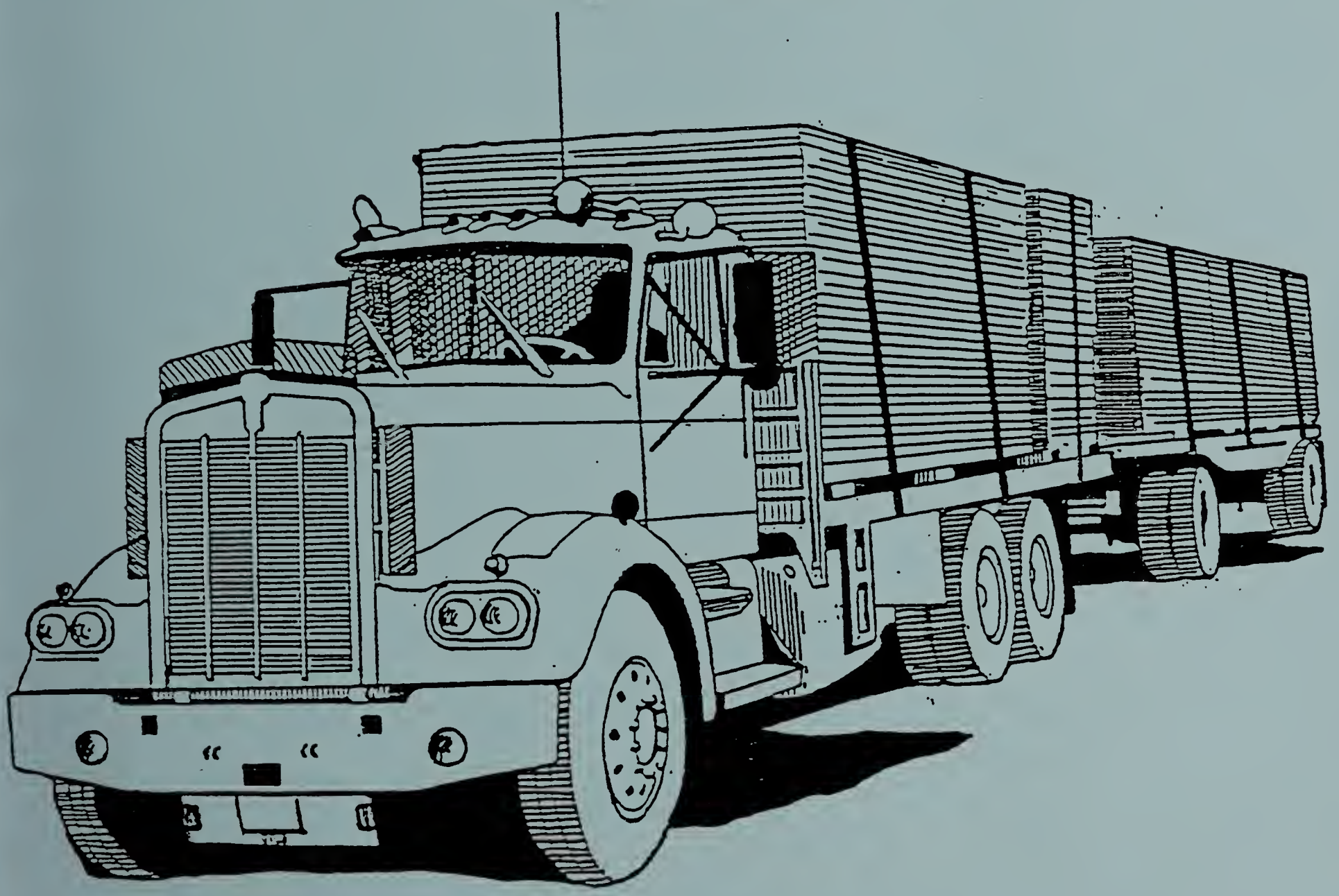

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TABLE OF CONTENTS

INTRODUCTION 2

GENERAL 2-4

I. INTERSTATE SYSTEM 5-16
- A. TRAFFIC ACCIDENT TOTALS 5-6
- B. TRAFFIC ACCIDENT RATES 6-7
- C. TRAFFIC ACCIDENT SEVERITY RATES 7-8
- D. TRAFFIC ACCIDENT DETAILS 8-9
- E. TRAFFIC ACCIDENT CLUSTER LOCATIONS 9-11
- F. ROUTE SEGMENTS 11-14
- G. MULTIPLE TRAILER UNITS 14-15
- H. FINDINGS 15-16

II. PRIMARY SYSTEM 17-38
- A. TRAFFIC ACCIDENT TOTALS 17-20
- B. TRAFFIC ACCIDENT RATES 20-21
- C. TRAFFIC ACCIDENT SEVERITY RATES 21
- D. TRAFFIC ACCIDENT DETAILS 22-23
- E. TRAFFIC ACCIDENT CLUSTER LOCATIONS 24
- F. ROUTE SEGMENTS 24-35
- G. MULTIPLE TRAILER UNITS 36
- H. FINDINGS 37-38

III. COUNTERMEASURES/BENEFIT-COST ANALYSIS 39-41

IV. CONCLUSIONS 41

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INTRODUCTION

A need was demonstrated to compile statistical data concerning the commercial motor vehicles or large trucks that traverse Montana's highways. This study attempts to address this need by presenting various types of commercial motor vehicle or large truck highway data such as: Traffic Volumes, Accident Statistics, Accident Rates, Severity Rates, Accident Cluster Locations, and comparing this data with all vehicles.

The prime objective of this study is to provide a documented traffic accident history to aid in determining whether special geometric design features should be considered for a specific federal aid highway construction project.

Another objective was to identify possible countermeasures that would address the various commercial motor vehicle accident types and if realistic, perform a cost effectiveness analysis for each accident type.

GENERAL

A commercial motor vehicle is defined as any vehicle with a minimum of two axles and six tires when it pertains to compiling traffic volumes. To obtain commercial motor vehicle accident data, the category "Truck/Truck Tractor" body style on the Montana Highway Patrol accident report form was used.

For the remainder of this report to maintain consistency, the commercial motor vehicle or large truck will be referred to as large truck.

For this study, only the interstate and primary system roadways are addressed. Large truck traffic volume data is not readily available from the Highway Information System's computer program for the Federal Aid Secondary, Urban and local road system roadways. The Highway Information System's past storage of all vehicular traffic volume data is limited to three consecutive calendar years - 1988-1989-1990. In order to retain consistency throughout this report, only these three years of data were used.

This information pertains to reported traffic accidents only and only addresses vehicles that were directly involved in the accident.

In this study, the larger truck accident picture was addressed and compiled in the manner and process as the Hazard Elimination Safety Program is conducted in this state. This safety program monitors all traffic accident data on a continuing basis on all highway systems.

For simplification, Fatal Accident will be abbreviated to FAT. ACC., Injury Accident will be INJ. ACC. and Property Damage Accident will be P.D. ACC. for the remainder of this study.

This study attempts to summarize and compare statistical data for larger trucks with other vehicular traffic on (1) a statewide basis; (2) for the interstate and primary highway systems and the federal aid routes within these systems; and (3) on route segments within the federal aid routes.

The overall intent of this study is to:

1. Document detailed statistical data for large trucks that are travelling on Montana's interstate and primary system roadways.

2. Identify roadway routes or route segments that are experiencing a higher than normal large truck accident frequency or rate.

3. Define the routes and/or route segments that will not require a large truck accident analysis prior to design changes.

4. Provide a traffic accident reference when deciding whether or not a design change should be approved.

5. Identify truck accidents by the number of trailer units being pulled (none/single, double, triple*).

6. Identify specific large truck accident types or trends, if any, and perform cost effective analysis on possible countermeasures.

7. Compare data from previous report to identify possible trends in truck accidents as compared to this report.

8. Provide a basic document that can be updated on a continuing basis to keep the commercial motor vehicle data current on a yearly basis.

*Note: Triple trailer units were allowed in Montana as of July 1, 1989.

I. INTERSTATE SYSTEM

A. Traffic Accident Totals

1. Interstate 15 - Involving Large Trucks

	FAT. ACC.	INJ. ACC.	P.D. ACC.
1988	0	16	25
1989	0	17	45
1990	1	11	28
TOTAL	1	44	98

TOTAL ACCIDENTS = 143

2. Interstate 90 - Involving Large Trucks

	FAT. ACC.	INJ. ACC.	P.D. ACC.
1988	4	66	102
1989	7	92	171
1990	4	58	117
TOTAL	15	216	390

TOTAL ACCIDENTS = 621

3. Interstate 94 - Involving Large Trucks

	FAT. ACC.	INJ. ACC.	P.D. ACC.
1988	0	14	29
1989	1	15	21
1990	1	8	12
TOTAL	2	37	62

TOTAL ACCIDENTS = 101

4. Interstate Total - Large Trucks

	FAT. ACC.	INJ. ACC.	P.D. ACC.	TOTAL
1988	4	96	156	256
1989	8	124	237	369
1990	6	77	157	240
TOTAL	18	297	550	865

TOTAL LARGE TRUCK INVOLVED ACCIDENTS = 865

2.1% of all large truck accidents involve a Fat. Acc. or 1 in 48.1 acc.
34.3% of all large truck accidents involve an Inj. Acc. or 1 in 2.9 acc.
63.6% of all large truck accidents involve a P. D. Acc. or 1 in 1.6 acc.

5. Interstate Total - Non Truck Accidents

	FAT. ACC.	INJ. ACC.	P.D. ACC.	TOTAL
1988	24	449	858	1331
1989	26	531	956	1513
1990	35	462	928	1425
TOTAL	85	1442	2742	4269

Total Non-Truck Accidents = 4,269

2.0% of all non-large truck accidents involve a Fat. Acc. or 1 in 50.2
33.8% of all non-large truck accidents involve an Inj. Acc. or 1 in 3.0
64.2% of all non-large truck accidents involve a P. D. Acc. or 1 in 1.6

6. Interstate Total - All Vehicle Accidents

	FAT. ACC.	INJ. ACC.	P.D. ACC.	TOTAL
1988	28	545	1014	1587
1989	34	655	1193	1882
1990	41	539	1085	1665
TOTAL	103	1739	3292	5134

Total All Vehicle Accidents = 5,134

2.0% of all accidents involve a Fat. Acc. or 1 in 49.8
33.9% of all accidents involve an Inj. Acc. or 1 in 3.0
64.1% of all accidents involve a P. D. Acc. or 1 in 1.6

17.4% of the Fat. Acc. involve a truck.
17.1% of the Inj. Acc. involve a truck.
16.8% of the accidents on the interstate involve a truck.

B. Traffic Accident Rates

1. General:

a. Accident rate is per million vehicle miles.

b. Average Annual Daily Traffic obtained from "Traffic by Sections - Montana 1989."

c. Time frame of data = 1988 - 1990, 3 years.

d. Interstate mileages obtained from "Traffic by Sections - Montana 1989."

e. Accident Rate Formula

$$AR = \frac{\#\ \text{Accident} \times 1{,}000{,}000}{\text{AADT} \times \text{No. Yrs.} \times 365 \times \text{Length}}$$

f. Also used in conjunction with the accident rate is a high average accident rate which provides a range or cutoff point for identifying a location or roadway that may have a higher than normal accident rate. The formula used to establish the high average accident rate is:

$$R = AR+K((AR/M)+(M/2))^{.5}$$

Where:

R = High Average Accident Rate

AR = Average Accident Rate for roadway or section in question

M = Daily vehicle miles travelled in millions of miles

K = A probability factor determined by the level of statistical significance desired for R. For this report, a 90 percent confidence level was used. (1.282)

2. Interstate 15 - Large Truck Accidents

$$AR = \frac{143 \times 1{,}000{,}000}{446 \times 3 \times 365 \times 382.7}$$

AR = 0.77

3. Interstate 90 - Large Truck Accidents

$$AR = \frac{621 \times 1{,}000{,}000}{1138 \times 3 \times 365 \times 515.6}$$

AR = 0.97

4. Interstate 94 - Large Truck Accidents

$$AR = \frac{101 \times 1{,}000{,}000}{617 \times 3 \times 365 \times 245.8}$$

AR = 0.61

5. Interstate System Total - Large Truck Accidents

$$AR = \frac{865 \times 1{,}000{,}000}{794 \times 3 \times 365 \times 1144.1}$$

AR = 0.87, High Average = 2.39

6. Interstate System Total - <u>All Vehicle</u> Accidents

$$AR = \frac{5132 \times 1{,}000{,}000}{4003 \times 3 \times 365 \times 1144.1}$$

AR = 1.02

C. Traffic Accident Severity Rates

1. General

a. Severity Rate Formula

$$SR = \frac{5.8\ (\text{No. Fat.})\ (\text{Acc.}) + 2.0\ (\text{No. Inj.})\ (\text{Acc.}) + 1.0\ (\text{No. P.})\ (\text{D. Acc.})}{\text{No. Accidents}}$$

2. Interstate 15 - Large Truck Accidents

$$SR = \frac{5.8(1) + 2.0(44) + 1.0(99)}{143} = \frac{5.8 + 84 + 98}{143}$$

SR = 1.31

3. Interstate 90 - Large Truck Accidents

$$SR = \frac{5.8(15) + 2.0(216) + 1.0(390)}{621} = \frac{87 + 432 + 390}{621}$$

$$SR = 1.46$$

4. Interstate 94 - Large Truck Accidents

$$SR = \frac{5.8(2) + 2.0(37) + 1.0\ (62)}{101} = \frac{11.6 + 74 + 62}{101}$$

$$SR = 1.46$$

5. Interstate System - Total Large Truck Accidents

$$SR = \frac{5.8(18) + 2.0(297) + 1.0(550)}{865} = \frac{104.4 + 594 + 550}{865}$$

$$SR = 1.44$$

6. Interstate System Total - All Vehicles

$$SR = \frac{5.8(103) + 2.0(1739) + 1.0(3292)}{5134} = \frac{597.4 + 3478 + 3292}{5134}$$

$$SR = 1.43$$

D. Traffic Accident Details

1. Interstate System Rates as reported by SAS Report

a. First Harmful Event	Large Truck Accidents %	Statewide Average All Veh. %
Overturn	22.9	29.3
Pedestrian	0.6	0.3
MV in Trans.	31.5	14.8
MV Other Rdwy.	0.2	0.1
Parked MV	4.8	1.8
Train	0.0	0.0
Pedacycle	0.0	0.0
Animal	3.7	10.8
Fixed Obj.	21.0	35.9
Other Obj.	2.3	2.0
Other Non-collision	13.0	5.0
b. On/Off Road		
On	55.6	38.4
Off	44.4	61.6
c. Weather		
Clear	46.3	53.2
Raining	4.8	3.7
Snowing	26.8	17.9
Fog	0.9	1.0
Overcast/Cloudy	21.1	24.3

		Large Truck Accidents		Statewide Average
d.	No. Vehicles	No. Acc.	%	All Veh. %
	Single Veh.	525	60.7	N/A
	Two Veh.	325	37.6	N/A
	Three Veh.	11	1.3	N/A
	Four Veh.	3	0.3	N/A
	Five Veh.	0	0.0	N/A
	Six Veh.	1	0.1	N/A
e.	Light Condition			
	Daylight		58.4	57.7
	Dawn/Dusk, Dark, Unlit		39.7	40.6
	Park (Lit)		1.9	1.7
f.	Road Condition			
	Dry		47.8	52.3
	Wet		5.8	6.8
	Icy/Snowy		44.2	40.4
	Slushy		2.1	2.7
	Natural Debris		0.1	0.0
g.	Collision Type			
	Head on		1.1	0.4
	Rear End		12.7	6.8
	Angle		8.3	4.3
	Sideswipe Meet		0.6	0.2
	Sideswipe Pass		8.4	3.0
	Backed Into		0.6	0.1
	Other		68.1	85.1
	Parking Man		0.2	0.0
h.	First Object Hit Off Roadway			
	1. End of Overpass		0.5	0.3
	2. Overpass Guardrail		2.1	3.3
	3. Overpass Railing		2.1	2.8
	4. End of Underpass		0.0	0.0
	5. Pier of Underpass		0.1	0.1
	6. Underpass Guardrail		1.1	1.0
	7. Pole		0.5	0.3
	8. Pole Guardrail		0.0	0.0
	9. Sign		1.5	1.6
	10. Sign Guardrail		0.1	0.1
	11. Median Guardrail		1.9	5.3
	12. Fill Guardrail		5.4	5.3
	13. End of Guardrail		0.7	1.0
	14. Other Guardrail		2.1	2.3
	15. Tree		0.2	0.5
	16. Cut Slope		7.2	8.4
	17. Fill Slope		0.2	0.6
	18. Road Approach		0.3	0.3
	19. Rock or Boulder		0.2	0.7
	20. Drainage Pipe		0.1	0.3
	21. Building		0.1	0.1
	22. Fence		4.5	7.3
	23. Median or Curb		0.5	0.6
	24. Other Object		1.8	1.5
	25. Delineator		4.0	5.2
	26. Mail Box		0.0	0.0
	27. Fire Hydrant		0.0	0.0
	28. No Object Hit		62.6	51.0
	29. Unknown		0.1	0.1

E. Traffic Accident Cluster Locations

a. The following listing identifies locations where five or more large truck-involved accidents have occurred within an 0.5 mile section of roadway in the years 1988-89-90 combined. If additional accidents occurred within 0.2 mile, the length of the section was increased. These parameters were selected purely for information and do not necessarily mean that these locations should be addressed for possible corrective type recommendations.

b. It should be noted that major projects have recently been completed or planned in the near future at many of the locations listed below. This should enhance the overall safety of the facility and aid in reducing all types of accidents.

ROUTE	MILEPOST	LOCATION	NUMBER LARGE TRUCK ACCIDENTS	REMARKS
I-15	122.2 - 123.0	Rocker Interchange	8	
	124.2 - 124.9	West Butte Interchange	7	Reconst 87
	347.7 - 398.0	Sweet Grass Interchange	5	Repave 90
I-90	1.0 - 1.8	Look Out Pass	7	
	12.4 - 12.7	Saltese - Haugan	6	
	23.2 - 24.4	Henderson - Drexel	20	
	96.1 - 96.6	Desmet Interchange	9	
	103.0 - 105.5	Missoula	6	
	150.2 - 150.8	Bearmouth - Drummond	6	
	173.1 - 173.8	Phosphate - Garrison	6	Repave 82
	232.3 - 233.663	Homestake Pass	9	Repave 84
	317.2 - 317.8	Bozeman Hill	6	Repave 84
	321.0 - 321.9	Bozeman Hill	11	Repave 84
	333.7 - 334.5	Livingston	8	Reseal 82
	375.2 - 375.4	Big Timber - Greycliff	6	Repave 82
	402.2 - 403.0	Springtime - Columbus	9	Repave 82
	456.580	Pinehill Interchange	6	Repave 85

I-94 None

F. Route Segments

a. The following listing attempts to breakdown the interstate system into segments. The segment breaks occur primarily where the route intersects another major route. The reason being traffic patterns change at these major traffic junctions.

b. The segment length reflects the true mileage between the sections.

c. To obtain an accurate as possible accident rate, city mileage was omitted as the accident data reflects only rural accidents.

d. The large truck Average Daily Traffic was averaged for 88-89-90 and represents rural counts only.

1. I-15 Route Segments

MILEPOST	LOCATION	SEGMENT LENGTH	AADT	LARGE TRUCK ACC. RATE	LARGE TRUCK SEV. RATE	TOTAL ACC.
0.000	Montana - Idaho Line					
		62.456	371	0.32	1.63	8
62.448	So. Dillon Interchange					
		58.756	451	0.55	1.31	16
121.132	Nissler Int. - Jct. I-90					
		8.325	1574	1.39	1.20	20
129.455	E. Butte Int. - Jct. I-90					
		34.884	394	0.66	1.30	10
164.920	Boulder Int. - Jct. P-69					
		27.201	541	0.31	1.40	5
192.148	Capitol Int. - Jct. P-8					
		86.434	457	0.81	1.45	35
278.976	10th Ave. S. - Jct. I-315					
		11.538	616	0.77	1.17	6
290.680	Vaughn Int. - Jct. P-3					
		71.741	432	0.74	1.36	25
363.488	W. Shelby Int. - Jct. P-1					
		34.692	355	1.33	1.22	18
398.184	Montana/Canadian Line					

2. I-90 Route Segments

MILEPOST	LOCATION	SEGMENT LENGTH	AADT	LARGE TRUCK ACC. RATE	SEV. RATE	TOTAL ACC.
0.000	Montana - Idaho Line					
		95.643	913	1.34	1.51	128
96.343	Desmet Int. - Jct. P-5					
		13.882	1481	0.80	1.66	18
109.224	Bonner Int. - Jct. P-24					
		64.081	1174	0.84	1.50	69
174.363	W. Garrison Int. - Jct. P-88					
		43.641	1133	0.63	1.35	34
219.169	Nissler Int. - Jct. I-15					
		*8.325	*1574	*1.39	*1.20	*20
227.455	E. Butte Int. - Jct. I-15					
		47.544	1175	0.80	1.49	49
274.791	W. Three Forks Int. - Jct.P-8					
		23.486	1498	0.67	1.35	26
298.279	Belgrade Int. - Jct. P-85					
		11.095	1663	0.49	1.70	10
309.37	E. Boz. Int. - Jct. P-50					
		23.216	1563	1.16	1.26	46
332.941	S. Liv. Int. - Jct. P-11					
		7.470	1223	1.70	1.29	17
340.410	Mission Int. - Jct. P-59					
		68.497	1243	0.15	1.50	107
408.903	Columbus Int. - Jct. P-78					
		25.182	1388	0.50	1.32	19
434.090	Laurel Int. - Jct. P-4					
		18.764	1713	0.60	1.70	21
452.856	Lockwood Int. - Jct. P-16					
		3.719	1679	1.32	1.56	9
456.580	Pine Hill Int. - Jct. I-94					
		39.356	827	0.95	1.32	34
495.998	W. Hardin Int. - Jct. P-48					
		14.894	853	0.93	1.83	13
510.887	Custer Battlefield Int. - Jct. P-37					
		43.553	610	0.72	1.48	21
554.446	Montana - Wyoming Line					

*Note: Same route segment as I-15 MP 121.132-129.455. Accidents were counted as part of I-15, not as part of I-90.

3. I-94 Route Segments

MILEPOST	LOCATION	SEGMENT LENGTH	AADT	LARGE TRUCK ACC. RATE	SEV. RATE	TOTAL ACC.
0.000	Pine Hill Int. - Jct. I-90	49.121	722	0.64	1.72	25
49.551	Mont. 47 Int. - Jct. P-48	43.653	735	0.48	1.18	17
93.612	W. Forsyth Int. - Jct. P-14	44.845	603	0.84	1.55	25
138.330	Broadus Int. - Jct. P-23	72.833	557	0.41	1.71	18
211.480	Circle Int. - Jct. P-57	1.879	584	0.83	1.00	1
213.359	Sidney Int. - Jct. P-20	29.102	523	0.78	1.38	13
242.473	East Wibaux Int. - P-27	7.720	458	0.77	2.00	3
250.196	Montana - North Dakota Line					

G. Multiple Trailer Units

1. Double Trailer Units

a. During 1988, 1989, and 1990, there were 100 accidents involving double trailer units on the interstate system. These accidents are 11.6% of the truck accidents and 1.9% of all vehicle accidents.

b. There were 2 fatality accidents and 27 injury accidents. The fatal accidents are 11.1% of the truck fatal accidents and 1.9% of all vehicle fatal accidents. The injury accidents are 9.1% of truck injury accidents and 1.6% of all vehicle injury accidents.

c. There is no data for Annual Daily Traffic for double trailer units; therefore, an accident rate cannot be calculated. The severity rate for double trailer units is 1.36 compared to 1.46 for truck accidents and 1.43 for all vehicle accidents.

2. Triple Trailer Units

a. During 1988, 1989, and 1990 there were 5 accidents involving triple trailer units. These accidents are .5% of truck accidents and .1% of all vehicle accidents. There were no fatalities or injuries sustained in these accidents.

b. There is no data for Annual Daily Traffic for triple trailer units; therefore, an accident rate cannot be calculated. The severity rate for triple trailer units is 1.00 compared to 1.46 for truck accidents and 1.43 for all vehicle accidents.

3. Based on the accident data, multiple trailer units do not indicate they are any a higher than the normal accident frequency range than other vehicles traversing the interstate system.

H. Findings

1. The large truck accident rate is 0.87 and the high average rate is 2.39. This is consistent with the rates for all vehicles travelling the system.

2. The large truck accident severity rate is 1.44. This is consistent with the severity rates for all vehicles on the Interstate system.

3. The Average Daily Large Truck Traffic (794) on the Interstate system accounts for 20% of the total traffic (4003). Additionally, 17% of the total traffic accidents (5132) involve a large truck (865).

4. Some general observations pertaining to accidents involving large trucks during the three years are:

   a. 1 in 5.9 of all accidents involve a large truck on the interstate.

   b. 1 in 5.7 of all the fatal accidents involve a large truck.

   c. 1 in 2.6 large truck accidents involve another vehicle.

5. Based on traffic exposure and other accident data, the large truck accident frequency <u>does not</u> indicate that they are any higher than the normal accident frequency range for all vehicles traversing the interstate system. There are, however, roadway segments or locations that do exceed these averages and are identified in Sections E and F of this report. Accident clusters or groupings of large truck accidents generally occur on mountain passes and other geographic locations where horizontal curves are present and during snowing and icy roadway conditions. Large truck accident groupings also tend to occur in the vicinity of some high volume interchange areas. These trends, however, are consistent with accident clusters involving all types of vehicles.

6. The traffic accident data in this study can be utilized to address the accident portion in determining the design exception process when a proposed federal-aid construction project is in the planning stages.

7. The traffic accident statistics in this study will be updated on a continuing basis to insure large truck data is kept as current as possible and to identify any traffic volume or accident frequency changes that may occur in the future.

II. PRIMARY SYSTEM

A. Traffic Accident Totals

1. Large Truck Accidents

a. The following table lists only the F.A. Primary Routes where "one or more" reported accidents involving large trucks occurred during the years 1988-90.

b. Annual Average Daily Traffic was obtained from the "Traffic by Sections" publication.

c. Primary route mileage was obtained from the "1989 Montana Federal Aid Road Log" publication.

d. The same formulas were used in determining accident rates and severity rates for the primary system as the interstate system.

PRIMARY SYSTEM ROUTES
LARGE TRUCK ACCIDENT DATA

FAP ROUTE	FAT. ACC.	INJ. ACC.	P. D. ACC.	TOTAL ACC.	RURAL LENGTH MILES (1990)	ADT ALL VEH./TRUCK	ACC. RATE	SEV. RATE
1	6	69	112	187	646.6	1726/185	1.43	1.52
2	0	1	5	6	91.4	583/84	0.71	1.17
3	0	5	15	20	107.1	1052/90	1.89	1.25
4	1	6	14	21	56.1	2490/301	1.14	1.51
5	4	36	57	97	174.6	4185/475	1.07	1.75
6	1	17	15	33	114.1	1346/172	1.53	1.66
7	1	18	21	40	87.9	4781/324	1.28	1.57
8	1	10	24	35	103.3	2791/322	0.96	1.42
9	0	3	4	7	64.1	456/55	1.81	1.43
10	2	4	16	22	107.8	1605/248	0.75	1.62
11	0	5	6	11	56.7	1723/114	1.57	1.45
12	0	7	5	12	8.6	2279/304	4.18	1.58
13	1	0	7	8	97.6	943/114	0.66	1.60
14	0	6	13	19	263.5	562/89	0.74	1.32
16	0	13	33	46	44.7	1739/223	4.21	1.28
18	0	1	2	3	81.8	267/40	0.84	1.33
19	0	2	6	8	60.3	1233/107	1.13	1.25
20	0	4	6	10	61.2	2029/300	0.50	1.60
22	0	1	4	5	86.1	855/93	0.57	1.20
23	0	13	19	32	137.2	711/151	1.41	1.41
24	2	19	30	51	140.3	1526/288	1.15	1.56
25	0	3	3	6	52.2	640/90	1.17	1.50
26	0	1	3	4	7.5	1131/188	2.59	1.25
27	0	1	2	3	77.4	462/66	0.54	1.33
28	0	0	1	1	62.5	1232/53	0.28	1.00
29	0	4	3	7	81.9	910/84	0.93	1.57
30	0	1	0	1	23.4	321/47	0.83	2.00
32	0	0	2	2	64.8	284/48	0.59	1.00
33	0	4	4	8	66.4	688/108	1.02	1.50
34	0	1	0	1	15.4	477/83	0.71	2.00
35	1	0	3	4	21.4	939/127	1.34	2.20
36	0	2	3	5	46.7	771/93	1.05	1.40
37	3	16	21	40	103.6	1063/251	1.40	1.76
38	0	0	1	1	4.5	5056/441	0.46	1.00
39	0	1	3	4	51.2	1090/117	0.61	1.25
41	0	1	2	3	32.5	383/41	2.06	1.33
43	0	0	2	2	42.3	591/82	0.53	1.00
45	1	1	6	8	43.3	570/82	2.06	1.73
46	0	1	5	6	76.5	323/55	1.30	1.17
47	0	0	0	1	6.8	1199/124	1.08	1.00
48	1	4	2	7	30.6	706/78	2.68	2.26

PRIMARY SYSTEM ROUTES
LARGE TRUCK ACCIDENT DATA

FAP ROUTE	FAT. ACC.	INJ. ACC.	P. D. ACC.	TOTAL ACC.	RURAL LENGTH MILES (1990)	ADT ALL VEH./TRUCK	ACC. RATE	SEV. RATE
49	0	3	5	8	26.4	1223/222	1.25	1.38
50	0	14	28	42	83.7	2739/338	1.36	1.33
51	0	0	2	2	70.7	325/64	0.40	1.00
52	1	14	22	37	50.9	3153/398	1.67	1.51
53	1	7	11	19	40.7	1160/192	2.22	1.62
54	0	0	2	2	29.3	356/60	1.04	1.00
55	0	0	1	1	12.2	1353/203	0.37	1.00
56	0	3	4	7	34.6	777/105	1.76	1.43
57	3	15	32	50	321.0	838/138	1.03	1.59
58	0	2	1	3	50.2	827/49	1.11	1.67
59	0	4	6	10	56.4	607/86	1.88	1.40
60	0	3	6	9	88.7	1000/126	0.74	1.33
61	0	4	13	17	155.8	595/91	1.10	1.24
62	0	2	0	2	35.3	896/160	0.32	2.00
63	1	5	12	18	38.6	1253/268	1.59	1.54
66	0	0	3	3	50.0	629/90	0.61	1.00
69	1	1	7	9	36.7	909/149	1.50	2.42
72	0	1	4	5	21.5	950/116	1.83	1.20
75	0	0	2	2	2.4	1386/290	2.58	1.00
78	0	2	6	8	46.4	958/55	2.86	1.20
80	0	1	1	2	64.3	374/61	0.46	1.50
81	0	0	2	2	41.6	290/47	0.93	1.00
82	0	0	2	2	6.9	3776/283	0.93	1.00
83	0	5	11	16	91.1	1130/154	1.04	1.31
84	0	0	1	1	29.0	971/65	0.48	1.00
85	0	3	3	6	6.7	3168/416	1.96	1.50
86	0	0	2	2	35.8	813/65	0.79	1.00
89	0	1	0	1	1.4	4754/154	4.39	2.00
91	0	0	1	1	2.9	2010/273	1.25	1.00
93	0	8	11	19	32.5	1318/267	2.06	1.42
98	0	0	1	1	1.8	2217/296	1.68	1.00
TOTAL	23	379	683	1094	5282.6	1243/154	1.23	1.49

2.9% of all large truck accidents involve a fatality accident or 1 in 34.2 accidents.
34.6% of all large truck accidents involve an injury accident or 1 in 2.9 accidents.
62.4% of all large truck accidents involve a property damage only accident or 1 in 1.6 accidents.

1. Large Truck Accidents

	FAT. ACC.	INJ. ACC.	P.D. ACC.	TOTAL
1988	10	130	252	392
1989	7	147	249	403
1990	15	102	182	299
TOTAL	32	379	683	1094

2. Non-Large Truck Accidents

	FAT. ACC.	INJ. ACC.	P.D. ACC.	TOTAL
1988	68	1257	1510	2835
1989	54	1224	1613	2891
1990	63	1110	1474	2647
TOTAL	185	3591	4597	8373

2.2% of all non-large truck accidents involve a fatality accident or 1 in 45.3 accidents.
42.9% of all non-large truck accidents involve an injury accident or 1 in 2.3 accidents.
54.9% of all non-large truck accidents involve a property damage only accident or 1 in 1.8 accidents.

3. All Vehicle Accidents

	FAT. ACC.	INJ. ACC.	P.D. ACC.	TOTAL
1988	78	1387	1762	3227
1989	61	1371	1862	3294
1990	78	1212	1656	2946
TOTAL	217	3970	5280	9467

2.3% of all vehicle accidents involve a fatality accident or 1 in 43.6 accidents.
41.9% of all vehicle accidents involve an injury accident or 1 in 2.4 accidents.
55.8% of all vehicle accidents involve property damage only accidents or 1 in 1.8 accidents.
14.7% of the fatal accidents involve a truck.
9.5% of the injury accidents involve a truck.
11.6% of the accidents on the primary system involve a truck.

B. Traffic Accident Rates

1. General:

a. Data obtained from "Traffic by Sections" publication and "1989 Montana Federal Aid Road Log" publication.

1. Primary system rural mileage = 5,282.6 miles
2. Average Annual Daily Traffic - All vehicles = 1,253
3. Average Annual Daily Traffic - Large Trucks = 154

2. Accident Rate - <u>All</u> Vehicles

$$AR = \frac{9467 \times 1{,}000{,}000}{1253 \times 3 \times 365 \times 5{,}282.6}$$

AR = 1.31

3. Accident Rate - Large Trucks

$$AR = \frac{1084 \times 1{,}000{,}000}{154 \times 3 \times 365 \times 5282.6}$$

AR = 1.23, High Average = 3.62

4. Accident Rate - <u>Non</u>-Large Truck Vehicles

$$AR = \frac{8373 \times 1{,}000{,}000}{1099 \times 3 \times 365 \times 5282.5}$$

AR = 1.32

C. Traffic Accident Severity Rates

1. Severity Rate - <u>All</u> Vehicles

$$SR = \frac{(5.8)217 + (2.0)3970 + (1.0)5280}{9467}$$

SR = 1.53

2. Severity Rate - Large Trucks

$$SR = \frac{(5.8)32 + (2.0)379 + (1.0)863}{1094}$$

SR = 1.49

3. Severity Rate - <u>Non</u>-Large Truck Vehicles

$$SR = \frac{(5.8)185 + (2.0)3591 + (1.0)4597}{8373}$$

SR = 1.53

D. Traffic Accident Details

1. Primary System Rates as Reported by SAS Report

	Large Truck Accidents %	Statewide Average All Veh. %
a. First Harmful Event		
Overturn	23.5	21.5
Pedestrian	0.3	0.7
MV in Trans.	48.4	39.5
MV Other Rdwy.	0.3	0.1
Parked MV	2.5	2.1
Train	0.0	0.0
Pedacycle	0.0	0.5
Animal	6.4	9.6
Fixed Obj.	12.9	23.6
Other Obj.	1.1	0.9
Other - Non Collision	4.6	0.0
b. Collision Type		
Head on	2.7	2.6
Rear End	13.3	13.1
Angle	15.7	16.8
Sideswipe Meet	5.6	2.4
Sideswipe Pass	9.2	4.0
Backed Into	1.3	0.8
Parking Maneuver	0.1	0.0
Other	52.1	60.2
c. Road Location		
Off Road	30.3	42.9
On Road	69.7	57.1
d. Light Condition		
Daylight	68.3	58.3
Dawn/Dusk, Dark, Unlit	28.0	37.1
Dark (Lit)	3.8	4.6
e. Road Condition		
Dry	67.8	64.6
Wet	6.7	7.9
Icy/Snowy	23.1	25.5
Slushy	2.2	1.9
Natural Debris	0.2	0.2
f. Weather Condition		
Clear	59.0	57.8
Raining	5.2	5.5
Snowing	12.7	11.2
Fog	0.8	0.8
Overcast/Cldy	22.2	24.7
Not Stated/Other	0.1	0.1

	Large Truck Accidents %	Statewide Average All Veh. %
g. First Object Hit Off Roadway		
1. End of Overpass	0.3	0.4
2. Overpass Guardrail	0.6	0.6
3. Overpass Railing	0.2	0.5
4. End of Underpass	0.0	0.0
5. Pier of Underpass	0.1	0.0
6. Underpass Guardrail	0.1	0.1
7. Pole (Light,Power,etc.)	1.0	1.4
8. Pole Guardrail	0.0	0.1
9. Sign	1.6	1.8
10. Sign Guardrail	0.3	0.1
11. Median Guardrail	0.1	0.2
12. Fill Guardrail	2.8	1.9
13. End of Guardrail	0.4	0.6
14. Other Guardrail	1.5	1.2
15. Tree	1.1	2.9
16. Cut Slope	7.9	9.5
17. Fill Slope	0.5	0.6
18. Road Approach	1.0	1.9
19. Rock or Boulder	0.8	2.0
20. Drainage Pipe	0.5	0.6
21. Building	0.2	0.2
22. Fence	4.2	4.6
23. Median or Curb	0.4	0.9
24. Other Object	2.4	2.3
25. Delineator	3.3	2.5
26. Mail Box	0.6	0.8
27. Fire Hydrant	0.1	0.1
28. No Object Hit	68.0	62.2
29. Unknown	0.1	0.2

h. No. Vehicles	No. Acc.		
Single Veh.	544	49.6	N/A
Two Veh.	509	46.5	N/A
Three Veh.	39	3.6	N/A
Four Veh.	4	0.4	N/A
Five Veh.	1	0.1	N/A

E. Traffic Accident Cluster Locations of Large Trucks

1. The same parameters and conditions apply for the primary system as were used for the Interstate system except four or more accidents were used.

ROUTE	MILEPOST	LOCATION	NUMBER OF LARGE TRUCKS ACCIDENTS	REMARKS
FAP 1	30.5 - 31.0	E. Libby	4	Reseal 85
	121.9 - 122.3	Kalispell (4-lane)	4	Repaved 87
	123.6 - 124.1	Kal. LaSalle Road	6	Reseal 85
	133.8 - 134.0	No. Kalispell	8	Reconst 85
	135.2 - 135.8	No. Kalispell	5	Reconst 85
FAP 5	0.0 - 0.2	Desmet	4	Reconst 86
	32.3 - 32.4	St. Ignatius	4	Repave 83
FAP 10	3.647 - 3.882	Great Falls	6	
FAP 16	0.1 - 1.60	Billings	35	
FAP 24	0.7 - 1.3	Bonner	6	Repave 90
FAP 37	60.75 - 60.90	Lame Deer - Ashland	6	
FAP 52	15.8 - 16.3	Polson - Big Fork	5	
FAP 93	18.6 - 18.7	W. of Lolo	4	Repave 88

F. Route Segments

a. Same procedures apply for the Primary System as for the Interstate System. See Page No. 11 for details.

ROUTE/ MILEPOST	LOCATION	SEGMENT LENGTH	AADT	LARGE TRUCKS ACC. RATE	LARGE TRUCKS SEV. RATE	TOTAL ACC.
FAP 1						
0.000	Montana/Idaho Line					
		15.529	168	3.15	1.78	9
16.932	Jct. FAP 56					
		14.990	341	2.86	1.25	16
32.313	Jct. FAP 33 - Libby					
		86.816	309	1.40	1.74	41
120.093	Jct. FAP 5 - Kalispell					
		12.450	622	2.48	1.33	21
133.915	Jct. FAP 38 - Columbia Falls					
		88.503	159	2.01	1.42	31
224.000	Jct. FAP 3 - Browning					
		52.637	142	1.47	1.33	12
278.459	Jct. I-15 - Shelby					
		97.747	134	0.49	1.14	7
379.167	Jct. FAP 10 - Havre					
		47.271	234	1.40	1.58	17
428.518	Jct. FAP 66 - Harlem					
		41.539	138	1.27	1.25	8
471.769	Jct. FAP 61 - Malta					
		69.387	141	0.47	1.60	5
543.809	Jct. FAP 31 - Glasgow					
		45.689	163	1.23	2.08	10
590.602	Jct. FAP 25 - Wolf Point					
		5.802	216	0.73	5.80	1
597.243	Jct. FAP 32 - Wolf Point					
		46.079	136	1.02	1.14	7
644.550	Jct. FAP 62 - Culbertson					
		22.152	121	0.68	1.00	2
667.149	Montana/North Dakota Line					
FAP 2						
0.000	Jct. I-94 West Miles City					
		2.230	189	0.00	0.00	0
2.756	Jct. FAP 18 - Miles City					
		2.604	211	3.32	1.50	2
6.197	Baker Int - Jct. I-94					
		75.334	93	0.52	1.00	4
83.041	Jct. P-27 - Baker					
		11.501	109	0.00	0.00	0
95.514	Montana/North Dakota Line					
FAP 3						
0.000	Jct. I-15 - Vaughn					
		7.935	408	2.26	1.00	8
8.408	Jct. FAP 24 - Sun River					
		30.987	123	0.72	1.33	3
41.214	Jct. FAP 9 - Choteau					
		42.181	37	4.68	1.50	8
84.363	Jct. FAP 44 - West Valier					
		26.012	43	0.82	1.00	1
110.633	Jct. FAP 1 - Browning					
FAP 4						
0.000	Montana/Idaho Line					
		24.749	178	0.83	1.50	4
24.737	Jct. FAP 72 - Bridger					
		16.840	353	0.77	1.60	5
42.765	Jct. FAP 28 - Rockvale					
		11.539	542	1.46	1.58	10
54.307	Jct. I-90 - Laurel Int.					
		2.988	173	3.53	1.00	2
58.198	Jct. I-90 - Mossmain Int.					

ROUTE/ MILEPOST	LOCATION	SEGMENT LENGTH	AADT	LARGE TRUCKS ACC. RATE	LARGE TRUCKS SEV. RATE	TOTAL ACC.
FAP 5						
0.000	Jct. I-90 - Desmet Int.	27.200	809	1.16	1.91	28
27.503	Jct. FAP 6 - Ravalli	29.933	809	1.17	1.45	31
59.004	Jct. FAP 52 - Polson	15.597	365	0.16	2.00	1
77.587	Jct. FAP 36 - Elmo	26.749	519	0.66	1.40	10
104.255	Jct. FAP 82 - Somers	6.465	803	1.06	1.50	6
112.666	Jct. FAP 1 - Kalispell	10.587	543	0.79	1.60	5
125.446	Jct. FAP 38 - Whitefish	51.222	244	1.17	1.31	16
180.909	Jct. FAP 33 - Eureka	6.547	144	0.00	0.00	0
187.441	Montana/Canadian Line					
FAP 6						
0.000	Montana/Idaho Line	10.408	112	1.57	1.50	2
10.404	Jct. FAP 56	64.578	181	1.02	1.75	13
76.846	Jct. FAP 36	8.320	210	2.09	1.25	4
85.033	Jct. FAP 35	30.861	172	2.41	1.71	14
116.203	Jct. FAP 5 - Ravalli					
FAP 7						
0.000	Montana/Idaho Line	79.683	304	1.28	1.47	34
83.388	Jct. FAP 93 - Lolo	7.231	759	1.00	2.13	6
95.276	Jct. FAP 71 - Missoula					
FAP 8						
0.000	Jct. FAP 88 - Garrison	12.889	252	0.84	2.60	3
13.008	Jct. FAP 41 - Avon	28.793	325	1.07	1.18	11
45+1.221	Jct. I-15 - Helena	30.481	425	0.78	1.36	11
77.531	Jct. FAP 14 - Townsend	29.877	307	0.80	1.38	8
107.893	Jct. I-90 - Three Forks	1.282	131	5.44	1.00	1
109.175	Jct. FAP 13 - Three Forks					
FAP 9						
0.000	Jct. I-15 - Wolf Creek	20.411	41	2.18	1.00	2
20.149	Jct. FAP 24 - Bowman's Corner	43.710	61	1.71	1.60	5
64.785	Jct. FAP 3 - Choteau					
FAP 10						
0.000	Jct. FAP 60 - Great Falls	38.469	333	1.14	1.73	16
40.641	Jct. FAP 80 - Fort Benton	69.375	189	0.47	1.33	6
111.313	Jct. FAP 1 - West Havre					

ROUTE/ MILEPOST	LOCATION	SEGMENT LENGTH	AADT	LARGE TRUCKS ACC. RATE	SEV. RATE	TOTAL ACC.
FAP 11						
0.000	Gardiner	52.929	114	1.21	1.50	8
53.068	Jct. I-90 - Livingston	3.276	316	2.65	1.33	3
57.950	Jct. I-90 - East Livingston					
FAP 12						
0.000	Montana/Idaho Line	8.623	304	4.18	1.58	12
9.385	Jct. FAP 50 - West Yellowstone					
FAP 13						
0.000	Montana/Idaho Line	8.564	56	0.00	0.00	0
8.630	Jct. FAP 87 - West Yellowstone	40.224	92	0.49	3.40	2
49.180	Jct. FAP 29 - Ennis	16.142	184	0.92	1.00	3
65.334	Jct. FAP 84 - Norris	18.633	113	0.87	1.00	2
83.952	Sappington Jct.	9.816	135	0.69	1.00	1
93.363	Jct. FAP 8 - Three Forks	3.315	180	0.00	0.0	0
97.332	Jct. I-90 - Three Forks					
FAP 14						
0.000	Jct. FAP 8 - Townsend	32.580	117	0.72	1.67	3
33.493	Jct. FAP 59 - White Sulphur Springs	10.599	121	1.42	1.00	2
45.138	Jct. FAP 60 - White Sulphur Springs	54.306	61	0.28	1.00	1
99.450	Jct. FAP 45 - Harlowton	0.504	220	0.00	0.00	0
100.898	Jct. FAP 63 - Harlowton	44.154	193	0.43	1.00	4
146.081	Jct. P-53 - Lavina	21.451	69	1.85	1.67	3
167.532	Jct. P-16 - Roundup	0.969	394	0.00	0.00	0
169.452	Jct. P-61 - Roundup	99.657	53	1.04	1.33	6
270.888	Jct. I-94 - Forsyth					
FAP 16						
0.000	Jct. I-90 - Billings	44.700	223	4.21	1.28	46
48.022	Jct. P-14 - Roundup					
FAP 17						
0.000	Jct. P-42 - Fort Peck	9.659	24	0.00	0.00	0
13.030	Jct. P-1 - Nashua					

ROUTE/ MILEPOST	LOCATION	SEGMENT LENGTH	AADT	LARGE TRUCKS ACC. RATE	LARGE TRUCKS SEV. RATE	TOTAL ACC.
FAP 18						
0.000	Jct. P-2 - Miles City	81.824	40	0.84	1.33	3
83.045	Jct. P-57 - Jordan					
FAP 19						
0.000	Jct. I-90 - Anaconda	60.334	107	1.13	1.25	8
64.000	Jct. I-90 - Drummond					
FAP 20						
0.000	Jct. P-57 - Glendive	49.623	305	0.42	1.29	7
50.012	Jct. P-26 - Sidney	1.463	680	0.00	0.00	0
52.569	Jct. P-62 - Sidney	10.318	309	0.86	1.67	3
64.245	Montana/North Dakota Line					
FAP 21						
0.000	Jct. I-15 - South Conrad	3.795	106	0.00	0.00	0
5.175	Jct. I-15 - North Conrad					
FAP 22						
0.000	Jct. P-32 - Scobey	41.393	53	0.83	1.00	2
43.377	Jct. P-30 - Plentywood	44.698	136	0.45	1.33	3
88.621	Jct. P-1 - Culbertson					
FAP 23						
0.000	Jct. P-2 - Miles City	1.017	340	0.00	0.00	0
2.165	Jct. I-94 - Miles City	73.845	90	2.75	1.30	20
76.303	Jct. P-37 - Broadus	5.990	367	0.00	0.00	0
83.090	Jct. P-54 - SE Broadus	56.768	215	0.90	1.58	12
139.854	Montana/Wyoming Line					
FAP 24						
0.000	Jct. I-90 - Bonner	32.627	457	1.41	1.21	23
31.892	Jct. P-83 - Culbertson	23.829	233	1.32	1.85	8
55.653	Jct. P-41 - Helmville	53.387	217	0.87	1.64	11
109.051	Jct. P-9 - Bowman's Corner	30.433	271	1.00	1.11	9
139.402	Jct. P-3 - Sun River					
FAP 25						
0.000	Jct. P-57 - Circle	46.296	84	1.17	1.60	5
46.912	Jct. P-32 - S. Wolf Point	5.844	141	1.10	1.00	1
53.064	Jct. P-1 - Wolf Point					

ROUTE/ MILEPOST	LOCATION	SEGMENT LENGTH	AADT	ACC. RATE	SEV. RATE	TOTAL ACC.
FAP 26						
0.000	Jct. P-20 - South Sidney	7.493	188	2.59	1.25	4
7.526	Montana/North Dakota Line					
FAP 27						
0.000	Ekalaka	34.284	53	1.01	1.50	2
35.445	Jct. P-2 - Baker	43.091	71	0.30	1.00	1
80.791	Jct. I-94 - Wibaux					
FAP 28						
0.000	Montana/Wyoming Line	8.703	8	0.00	0.00	0
8.706	Montana/Wyoming Line OUT - OF - STATE	-	-	-	-	-
45.000	Montana/Wyoming Line	23.469	21	0.00	0.00	0
70.185	Jct. P-78 - Red Lodge	30.347	96	0.31	1.00	1
101.708	Jct. P-4 - Rockvale					
FAP 29						
0.000	Jct. P-13 - Ennis	39.131	60	0.78	1.50	2
42.844	Jct. P-49 - Twin Bridges	14.010	225	1.45	1.60	5
57.272	Jct. P-55 - So. Whitehall	28.213	89	0.00	0.00	0
90.610	Jct. I-115 - Butte					
FAP 30						
0.000	Jct. P-22 - Plentywood	23.396	47	0.83	2.00	1
24.222	Westby - Montana/N.D. Line					
FAP 31						
0.000	Jct. P-42 - SE Glasgow	1.443	39	0.00	0.00	0
1.443	Jct. P-1 - East Glasgow	58.984	40	0.00	0.00	0
60.822	Montana/Canadian Line					
FAP 32						
0.000	Jct. P-25 - SE Wolf Point	50.696	47	0.77	1.00	2
51.317	Jct. P-22 - Scobey	14.075	25	0.00	0.00	0
65.819	Montana/Canadian Line					
FAP 33						
0.000	Jct. P-1 - Libby	66.083	108	1.02	1.50	8
66.897	Jct. P-5 - Eureka					

ROUTE/ MILEPOST	LOCATION	SEGMENT LENGTH	AADT	LARGE TRUCKS ACC. RATE	LARGE TRUCKS SEV. RATE	TOTAL ACC.
FAP 34						
0.000	Jct. P-22 - Plentywood	15.441	83	0.71	2.00	1
15.607	Montana/Canadian Line					
FAP 35						
0.000	Jct. I-90 - St. Regis	21.453	127	1.34	2.20	4
21.446	Jct. P-6 - Plains					
FAP 36						
0.000	Jct. P-6 - Plains	46.723	93	1.05	1.05	5
46.741	Jct. P-5 - Elmo					
FAP 37						
0.000	Jct. I-90 - Crow Agency	42.051	301	1.59	1.75	22
42.082	Jct. P-39 - Lame Deer	61.571	218	1.22	1.77	18
103.601	Jct. P-23 - Broadus					
FAP 38						
0.000	Jct. P-5 - So. Whitefish	4.512	441	0.46	1.00	1
4.498	Jct. P-1 - E. Columbia Falls					
FAP 39						
0.000	Jct. P-37 Lame Deer	51.189	117	0.61	1.25	4
51.217	Jct. I-94 W. Forsyth					
FAP 40						
0.000	Jct. I-94 S. Terry	0.403	229	0.00	0.00	0
0.403	Jct. FAS 253 Terry					
FAP 41						
0.000	Jct. P-8 - Avon	32.512	41	2.06	1.33	3
32.512	Jct. P-24 - W. Lincoln					
FAP 42						
0.000	Jct. P-57 - West Circle	58.545	22	0.00	0.00	0
58.581	Jct. P-17 - Fort Peck	14.668	74	0.00	0.00	0
73.246	Jct. P-31 - SE Glasgow	2.174	76	0.00	0.00	0
76.146	Jct. P-1 - Glasgow					
FAP 43						
0.000	Jct. P-57 - Lewistown	8.977	173	0.59	1.00	1
9.492	Jct. P-81 - No. Lewistown	33.326	68	0.47	1.00	1
42.865	Jct. P-61 - No. Grassrange					
FAP 44						
0.000	Jct. P-3 - No. Dupuyer	27.274	62	0.00	0.00	0
28.388	Jct. I-15 - West Valier					

ROUTE/ MILEPOST	LOCATION	SEGMENT LENGTH	AADT	LARGE TRUCKS ACC. RATE	LARGE TRUCKS SEV. RATE	TOTAL ACC.
FAP 45						
0.000	Jct. P-91 - Big Timber	43.330	82	2.06	1.73	8
43.942	Jct. P-14 - Harlowton					
FAP 46						
0.000	Jct. P-7	0.105	39	0.00	0.00	0
0.105	Montana/Idaho Line OUT - OF - STATE	-	-	-	-	-
1.166	Montana/Idaho Line	76.350	55	1.30	1.17	6
77.898	Jct. I-15 - Divide					
FAP 47						
0.000	Jct. P-19 - Anaconda	6.856	124	1.08	1.00	1
6.853	Jct I-90 - Warm Springs					
FAP 48						
0.000	Jct. I-90 - E. Hardin	1.899	231	0.00	0.00	0
1.060	Jct. I-90 - W. Hardin	28.748	70	3.18	1.00	7
29.809	Jct. I-94 - Custer					
FAP 49						
0.000	Jct. P-89 - Dillon	26.351	222	1.25	1.38	8
27.612	Jct. P-29 - Twin Bridges					
FAP 50						
0.000	West Yellowstone	14.883	278	1.77	1.38	8
15.198	Montana/Wyoming Line IN & OUT - OF - STATE	-	-	-	-	-
20.237	Montana/Wyoming Line	27.730	292	0.79	1.29	7
47.934	Jct. P-64 - Big Sky	33.967	384	1.75	1.32	25
81.910	Jct. P-84 & 85 - Four Corners	5.231	714	0.49	1.50	2
90.824	Jct. I-90 - Bozeman					
FAP 51						
0.000	Jct. P-57 - Circle	70.724	64	0.40	1.00	2
71.126	Jct. P-20 & 26 - Sidney					
FAP 52						
0.000	Jct. P-5 - Polson	33.916	413	1.83	1.53	28
33.928	Jct. P-82 - No. Bigfork	17.034	364	1.18	1.50	8
51.149	Jct. P-1 - Kalispell					
FAP 53						
0.000	Jct. I-90 - Billings	40.694	192	2.22	1.62	19
46.690	Jct. P-14 - Lavina					

ROUTE/ MILEPOST	LOCATION	SEGMENT LENGTH	AADT	LARGE TRUCKS ACC. RATE	LARGE TRUCKS SEV. RATE	TOTAL ACC.
FAP 54						
0.000	Montana/Wyoming Line	29.314	60	1.04	1.00	2
29.330	Jct. P-23 - Broadus					
FAP 55						
0.000	Jct. P-29 - So. Whitehall	12.112	202	0.37	1.00	1
12.523	Jct. P-69 - E. Whitehall	0.090	286	0.00	0.00	0
13.087	Jct. I-90 - E. Whitehall					
FAP 56						
0.000	Jct. P-6 - W. Noxon	34.640	105	1.76	1.43	7
34.640	Jct. P-1 - E. Troy					
FAP 57						
0.000	Jct. P-60 - Raynesford	36.735	316	0.87	2.05	11
36.651	Jct. P-80 - Stanford	28.122	323	1.21	1.82	12
64.958	Jct. P-63 - Eddie's Corner	16.104	268	0.85	1.25	4
82.056	Jct. P-43 - Lewistown	29.727	179	0.51	1.33	3
112.980	Jct. P-61 - Grassrange	97.480	50	1.50	1.25	8
212.180	Jct. P-18 - Jordan	35.808	53	0.00	0.00	0
248.630	Jct. P-42 - East Jordan	29.950	66	1.37	1.33	3
279.655	Jct. P-25 - Circle	1.016	167	0.00	0.00	0
280.776	Jct. P-51 - East Circle	46.082	121	1.47	1.50	9
329.339	Jct. I-94 - East Glendive					
FAP 58						
0.000	Jct. P-1 - Browning	50.248	49	1.11	1.67	3
50.366	Montana/Canadian Line					
FAP 59						
0.000	Jct. I-90 - E. Livingston	56.388	86	1.88	1.40	10
57.536	Jct. P-14 - S. White Sulphur Springs					
FAP 60						
0.000	Jct. P-14 - White Sulphur Springs	68.344	47	1.14	1.50	4
71.018	Jct. P-57 - SE Belt	20.318	473	0.40	1.20	5
95.717	Jct. I-315 - Great Falls					

ROUTE/ MILEPOST	LOCATION	SEGMENT LENGTH	AADT	LARGE TRUCKS ACC. RATE	LARGE TRUCKS SEV. RATE	TOTAL ACC.
FAP 61						
0.000	Jct. P-14 - Roundup	44.006	148	1.54	1.27	11
45.150	Jct. P-57 - Grassrange	21.490	78	1.63	1.00	3
66.624	Jct. P-43 - No. Grassrange	35.783	84	0.30	2.00	1
102.308	Jct. P-66 - So. Malta	54.507	62	0.54	1.00	2
157.617	Jct. P-1 - Malta					
FAP 62						
0.000	Jct. P-1 - Culbertson	35.343	160	0.32	2.00	2
38.069	Jct. P-20 - Sidney					
FAP 63						
0.000	Jct. P-14 - Harlowton	38.603	268	1.59	1.54	18
39.585	Jct. P-57 - Eddie's Corner					
FAP 64						
0.000	Jct. P-50 - Big Sky	9.173	61	0.00	0.00	0
9.188	Mountain Village					
FAP 65						
0.000	Jct. P-1 - West Glacier	0.305	58	0.00	0.0	0
0.305	Glacier Park Line					
FAP 66						
0.000	Jct. P-61 - NE Lewistown	50.015	90	0.61	1.00	3
49+1.009	Jct. P-1 - Fort Belknap					
FAP 67						
0.000	Jct. P-1 - Shelby	1.005	103	0.00	0.00	0
1.755	Jct. I-15 - No. Shelby					
FAP 68						
0.000	Jct. I-15 - So. Cascade	0.409	59	0.00	0.00	0
1.494	Jct. I-15 - No. Cascade					
FAP 69						
0.000	Jct. P-55 - So. Whitehall	36.660	149	1.50	1.64	9
38.398	Jct. I-15 - Boulder					
FAP 70						
0.000	Future Jct. I-90 Int. Non-Existent Roadway	-	-	-	-	-
1.235	Superior	0.062	24	0.00	0.00	0
2.796	Jct. I-90 - Superior					

ROUTE/ MILEPOST	LOCATION	SEGMENT LENGTH	AADT	LARGE TRUCKS ACC. RATE	LARGE TRUCKS SEV. RATE	TOTAL ACC.
FAP 72						
0.000	Montana/Wyoming Line	21.459	116	1.83	1.20	5
21.495	Jct. P-4 - Bridger					
FAP 75						
0.000	Jct. P-57 - Lewistown	2.445	290	2.58	1.00	2
2.941	Jct. P-43 - Lewistown					
FAP 77						
0.000	Jct. P-36 - Hot Springs	1.746	92	0.00	0.00	0
1.993	Hot Springs					
FAP 78						
0.000	Jct. P-28 - Red Lodge	29.519	34	2.73	1.33	3
29.991	Jct. S-419 - S. Absarokee	16.888	97	2.79	1.20	5
47.683	Jct. I-90 - Columbus					
FAP 79						
0.000	Jct. I-94 - Hysham	1.953	84	0.00	0.00	0
2.857	Jct. S-311 - Hysham					
FAP 80						
0.000	Jct. P-10 - Fort Benton	48.134	65	0.29	1.00	1
49.826	Jct. P-81 - Denton	16.154	44	1.28	2.00	1
67.174	Jct. P-57 - Stanford					
FAP 81						
0.000	Jct. P-80 - No. Stanford	41.575	47	0.93	1.00	2
42.472	Jct. P-43 - No. Lewistown					
FAP 82						
0.000	Jct. P-5 - Somers	6.947	283	0.93	1.00	2
6.889	Jct. P-52 - Bigfork					
FAP 83						
0.000	Jct. P-24 - Clearwater	91.117	154	1.04	1.31	16
90.995	Jct. P-52 - Bigfork					
FAP 84						
0.000	Jct. P-13 - Norris	29.031	65	0.48	1.00	1
29.075	Jct. P-50 - Bozeman					

ROUTE/ MILEPOST	LOCATION	SEGMENT LENGTH	AADT	LARGE TRUCKS ACC. RATE	LARGE TRUCKS SEV. RATE	TOTAL ACC.
FAP 85						
0.000	Jct. P-50 - Bozeman	6.711	416	1.96	1.5	6
6.661	Jct. I-90 - Belgrade					
FAP 86						
0.000	Jct. P-50 - Bozeman	35.760	65	0.79	1.00	2
37.700	Jct. P-59 - Wilsall					
FAP 87						
0.000	Jct. P-13 - Quake Lake	22.440	31	0.00	0.00	0
22.450	Jct. P-50 - N. West Yellowstone					
FAP 88						
0.000	Jct. I-90 - Garrison	1.422	159	0.00	0.00	0
1.422	Jct. I-90 - E. Garrison					
FAP 89						
0.000	Jct. I-15 - So. Dillon	1.352	154	4.39	2.00	1
3.233	Jct. I-15 0 No. Dillon					
FAP 91						
0.000	Jct. I-90 - W. Big Timber	2.669	273	1.25	1.00	1
3+1.031	Jct. I-90 - E. Big Timber					
FAP 93						
0.000	Montana/Idaho Line	32.543	262	2.04	1.42	19
32.545	Jct. P-7 - Lolo					
FAP 96						
0.000	Jct. P-19 - W. Drummond	0.116	92	0.00	0.00	0
1.097	Jct. I-90 - Drummond					
FAP 98						
0.000	Jct. I-94 - W. Glendive	1.841	296	1.68	1.00	1
1.841	Jct. P-57 - Glendive					

G. Multiple Trailer Units

1. Double Trailer Units

a. During 1988, 1989, and 1990, there were 109 accidents involving double trailer units on the primary system. These accidents are 10.0% of the truck accidents and 1.2% of all vehicle accidents.

b. There were 2 fatality accidents and 29 injury accidents. The fatalities are 6.3% of truck fatal accidents and .9% of all vehicle fatal accidents. The injury accidents are 7.1% of truck accidents and .7% of all vehicle injury accidents.

c. There is no data for Annual Daily Traffic for double trailer units on the primary system; therefore, the accident rate cannot be calculated. The severity rate is 1.35 compared to 1.49 for truck accidents and 1.53 for all vehicle accidents.

2. Triple Trailer Units

a. During 1988, 1989, and 1990, there were 3 accidents involving triple trailer units on the primary system. These accidents are .3% of truck accidents .03% of all vehicle accidents.

b. There were no fatality accidents with triple trailer units. There was only one injury accident. This accident is .3% of truck injury accidents and .03% of all vehicle accidents.

c. There is no data for Annual Daily Traffic for triple trailer units for the primary system. Therefore, the accident rate cannot be calculated. The severity rate is 1.33 compared to 1.49 for truck accidents and 1.53 for all vehicle accidents.

3. Based on the accident data, multiple trailer units do not indicate they are any higher than normal accident frequency range than other vehicles traversing the primary highway system.

H. Findings

1. The large truck accident rate is 1.23 and the high average is 3.62 for the primary system statewide. This rate is comparable to the accident rate of 1.31 for all vehicles traversing the primary system.

2. The large truck severity rate is 1.49. This also compares with the statewide average of 1.53 for all vehicles traversing the primary system.

3. The Average Daily Large Truck Traffic (154) on the primary system accounts for 12% of the total traffic. Additionally, 12% of the total traffic accidents (9,467) involve a large truck (1,094).

4. Some general observations pertaining to accidents involving large trucks are:

   a. 1 in 8.7 of all accidents on the primary system involve a large truck.

   b. 1 in 6.8 of all fatal accidents involve a large truck.

   c. 1 in 2.1 large truck accidents involve another vehicle.

5. Based on traffic exposure and other accident data, the large truck accident frequency does not indicate that they are any higher than the normal accident frequency range for <u>all</u> vehicles traversing the primary system. There are, however, roadway segments or locations that do exceed these averages and are identified in Sections E and F of this report. Generally, these identified locations are also consistent with accident clusters for <u>all</u> vehicles.

6. The traffic accident and exposure statistics in this study will be updated on a continuing basis to insure large truck data is kept as current as possible and to identify any traffic volume or accident frequency changes that may occur in the future.

III. COUNTERMEASURES/BENEFIT COST ANALYSIS

1. A search of the truck-involved accident statistics was conducted to possibly identify any accident types where a realistic countermeasure could be beneficial to the motoring public.

2. A review was conducted first on truck accidents that involved another vehicle since 50.4% on the primary system and 39.3% on the interstate system of the accidents are of this type.

A random sample of the accidents indicated that:

On the interstate system:

Truck driver being the principal cause of the accident = 30% of the time

Other driver being the principal cause of the accident = 70% of the time

On the primary system

Truck driver being the principal cause of the accident = 35% of the time

Other driver being the principal cause of the accident = 65% of the time

It should be noted that the principal cause was solely the judgment of the reviewer upon examining the narrative and other portions of the accident reports that were randomly selected.

Being the other driver was noted as being at fault 67.1% of the time, no attempt was made to address any type of countermeasure for trucks involved with other vehicles.

3. Off-roadway accidents were reviewed for possible corrective measures as they account for 44.4% of the total truck accidents on the interstate system and 30.3% on the primary system. One such

countermeasure would be continuous type rumble strips on the roadway shoulder to aid the motorist from leaving the travelled way. A recent study on the interstate system concluded that the installation of rumble strips during construction and by retrofit are cost beneficial improvements.

4. Single vehicle truck accidents account for 60.7% of the large truck accidents on the interstate and 49.6% on the primary system. These percentages are comparable to all vehicles traversing the systems. Also approximately 33% of the truck accidents were coded as the driver falling asleep or inattentive driving. In this same respect continuous side of the road rumble strips could be one believable countermeasure.

5. Other types of countermeasures were discussed such as:

   a. Escape ramps on mountain passes
   b. Climbing lanes on two-lane roads
   c. Reduced speed limits
   d. Improved pavement friction quality
   e. Horizontal and vertical curve realignment and flattening.

   No attempt was made to perform benefit cost analysis on the above countermeasures on a statewide basis. A realistic B/C would best be accomplished on a case-by-case situation.

6. It is concluded that the large truck accident situation is not extraordinary to any other type vehicle travelling Montana's inter-state and primary systems. There are situations and geographic locations where truck accidents tend to occur more frequently; however as previously stated, generally in these areas <u>all</u> vehicle accidents occur more frequently.

In conclusion, Montana has and will continue to enhance safety for the large trucks and all vehicles on its roadways. This is being accomplished by: 1) all responsible parties, in a unified effort continually stressing roadway safety; 2) incorporating proven safety design standards on all construction projects; 3) enforcing safety oriented regulations and laws for vehicles and drivers; 4) advanced safety training and public advertising; and 5) conducting on a continuing basis, a systematic procedure to identify and address any abnormal accident frequency that may occur on the state's roadway systems.

IV. CONCLUSIONS

1. The large truck accident rates and severity rates on a statewide average compare with all other vehicles traversing the interstate and primary systems.

2. The percentage of large truck accidents on the interstate and primary roadway systems compares with the percentage of large truck average daily traffic:

   Interstate - ADT = 20%, Accidents = 17%

   Primary - ADT = 12%, Accidents = 12%

3. Overall, the accident statistics do not identify any outstanding large truck-involved accident area that is considered to be of a critical nature or significant enough to require immediate countermeasure action.

4. There is no indication that the large truck is creating accident frequency trends any higher than any other vehicle for the exposure time on the roadways. There are roadway locations or segments that stand out as having a slightly higher than normal truck accident frequency. Generally, however these same locations or segments experience higher than normal frequencies for all vehicles.

5. Multiple trailer units do not create accident frequency or severity higher than all vehicles traversing Montana's highways.

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